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METHOD FOR MANUFACTURING CERAMIC LAMINATED ELECTRONIC COMPONENT

[Seramikku Seikiso Denshi Buhin No Seizo Hoho]

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Claim

1. A method for manufacturing a ceramic laminated electronic component, characterized by the fact that it consists of a step that prepares several trays which are provided with a bottom face wall and side surface walls rising from the peripheral edge part of the above-mentioned bottom face wall and in which several sheets of ceramic green sheets are housed in a laminated state in each inside and a step that prepares an absorbing head for absorbing the uppermost sheet of the above-mentioned ceramic green sheets in the above-mentioned trays by a vacuum suction; and a step that absorbs the above-mentioned ceramic green sheets from the above-mentioned several trays in a prescribed sequence by the above-mentioned absorbing head, a step that moves the above-mentioned absorbing head, which has absorbed the above-mentioned ceramic green sheets, up to a lamination station, and a step that places the above-mentioned ceramic green sheets on the above-mentioned lamination station are repeated.

Detailed explanation of the invention

[0001]

[1] Numbers in the margin indicate pagination in the foreign text.

(Industrial application field)

The present invention pertains to a method for manufacturing a ceramic laminated electronic component. In particular, the present invention pertains to a method for laminating ceramic green sheets being included in the manufacture of a ceramic laminated electronic component.

[0002]

(Prior art)

In case a ceramic laminated electronic component such as ceramic multilayered substrate and laminated ceramic capacitor, several sheets of ceramic green sheets are laminated. At that time, there are at least two kinds of ceramic green sheets to be laminated, and these kinds of ceramic green sheets must be laminated in a prescribed sequence. For example, in the ceramic multilayered substrate, as the ceramic green sheets to be laminated, there are several kinds in accordance with the existence and formation state of via holes, the existence and formation state of electrodes, etc.

[0003] Figure 5 is an oblique view showing a tray 1 being used in a process for laminating ceramic green sheets. The tray 1 has a tabular shape, and the same kind of ceramic green sheets 2 are arranged one sheet by one sheet in a planar shape on it. As mentioned above, in case several kinds of ceramic green sheets

are laminated, as shown in Figure 6, trays 1A, …, and 1E in which desired ceramic green sheets 2A, …, and 2E are respectively arranged are prepared. These trays 1A, …, and 1E are placed in a planar shape so that the ceramic green sheets 2A, …, and 2E put on each of the trays may be easily picked up. Then, as shown by an arrowhead in Figure 6, each of the ceramic green sheets 2A, …, and 2E are transferred one sheet by one sheet in a prescribed sequence by the hands of a worker or an absorbing head for a vacuum suction and laminated on a lamination station 3.

[0004]

(Problems to be solved by the invention)

However, according to the above-mentioned method for manufacturing a ceramic laminated electronic component, there are the following problems.

[0005] In other words, in case the kind of ceramic green sheets to be laminated is as large as 10-20 kinds, like a ceramic laminated substrate, since the same number of trays as the number of kinds is required, the area occupied by the trays is widened, so that the area productivity is lowered.

[0006] Also, since several ceramic green sheets are arranged in a planar shape on each tray, it is necessary to pick up specific ceramic green sheets from different places of each of these

trays in advancing the laminating process. Therefore, the movement of the absorbing head being used in the pick-up is complicated, so that the laminating process is difficult to be automated.

[0007] For these reasons, the purpose of the present invention is to a method for manufacturing a ceramic laminated electronic component in which the area productivity is raised and the automation is easy.

[0008]

(Means to solve the problems)

In the present invention, first, several trays provided with a bottom face wall and side surface walls rising from the peripheral edge part of the above-mentioned bottom face wall are prepared. In these trays, several sheets of ceramic green sheets are discriminated and housed in a laminated state in accordance with the kinds. On the other hand, an absorbing head for absorbing the uppermost sheet of the ceramic green sheets in the trays by a vacuum suction is prepared. Then, a step that absorbs the ceramic green sheets from several trays in a prescribed sequence by the absorbing head, a step that moves the absorbing head, which has absorbed the ceramic green sheets, up to a lamination station, and a step that places the ceramic green sheets on the lamination station are repeated.

[0009]

(Effects of the invention)

According to the present invention, since several ceramic green sheets being provided to the laminating process are housed in a laminated state in each tray, the area being occupied by several trays can be reduced, compared with the conventional case where several ceramic green sheets are arranged in a planar shape in the trays. Therefore, the area productivity can be improved. This method is more favorable especially for the case where a number of ceramic green sheets are laminated, like a ceramic multilayered substrate.

[0010] Also, since several ceramic green sheets housed in the trays are positioned by the side walls of the trays in the horizontal direction, several ceramic green sheets being housed in one tray are at the same position in the horizontal direction. For this reason, since the same kinds of ceramic green sheets can be absorbed at the same positions by the /3 absorbing head, the movement of the absorbing head is not considerably complicated, so that the lamination process can be easily automated. This result also leads to the cost reduction of a ceramic laminated electronic component.

[0011]

(Application example)

Figure 1 is a cross section showing a state in which an application example of the present invention is applied. Figure 1 shows tray 11, absorbing head 12, and lamination station 13.

[0012] The tray 11 is shown by an oblique view in Figure 2. Referring to Figures 1 and 2, the tray 11 is provided with a rectangular bottom face wall 14 and four side face walls 15 rising from the peripheral edge part of the bottom face wall 14. In the tray 11, the same kind of several ceramic green sheets 16 is housed in a laminated state. For these ceramic green sheets 16, in accordance with the kind or design of a ceramic laminated electronic component being obtained, via holes are formed, or electrodes are printed, or they are outer layer sheets.

[0013] A bottom view of the absorbing head 12 is shown in Figure 3. In Figures 1 and 3, the absorbing head 12 is provided with several suction holes 17, and a vacuum suction is selectively given via a vacuum passage 18 to these suction holes 17. The suction holes 17 are distributed only at the peripheral edge part of the absorbing head 12.

[0014] Preferably, a stepped part 19 is installed in an area enclosed by the suction holes 17 which is the lower surface of the absorbing head 12. The operation of the stepped part 19 is clarified by the following explanation.

[0015] The absorbing head 12, as shown by an arrowhead 20, is moved between the tray 11 and the lamination station 13. In other words, as shown on the left of Figure 1, when the absorbing head 12 is positioned above the tray 11, it is displaced downward until the absorbing head contacts with the uppermost green sheet of the ceramic green sheets 16 in the tray 11. At that time, since a vacuum suction is given via the suction holes 17, the uppermost sheet of the ceramic green sheets 16 is adsorbed to the absorbing head 12 by the vacuum suction. Then, the absorbing head 12, as shown by an arrowhead 20, is positioned above the lamination station 13 and further displaced downward. Then, the vacuum suction given via the suction holes 14 is released, and the ceramic green sheets 16 absorbed by the absorbing head 12 are placed on the lamination station 13. On the lamination station 13, ceramic green sheets 16a, 16b, and 16c that have already been laminated are shown.

[0016] On the right of Figure 1, the ceramic green sheets 16 adsorbed to the absorbing head 12 are shown in the figure. The ceramic green sheets 16 in a downward bent state as a whole due to the existence of the stepped part 19 and vacuum-absorbed via the suction holes 17 at only the peripheral edge part. The absorption pattern of the ceramic green sheets 16 prevents the ceramic green sheet 16 itself from being attached to the ceramic

green sheet under said sheet by an adhesive force. In other words, in the ceramic green sheets 16 being absorbed by the absorbing head 12, at the initial stage of the vacuum suction, first, since only its peripheral edge part is warped upward, an air is rapidly introduced between the ceramic green sheets 16 and prevents the attachment of the sheets. Therefore, the absorbing head 12 does not absorb two sheets or more of ceramic green sheets 16 but reliably absorbs only one sheet of ceramic green sheet. For this reason, if such an absorbing head 12 is used, the lamination reliability of the ceramic green sheets 16 is raised. Also, the automation of the laminating process is made easy.

[0017] Also, an optimum value of a step difference x being given by the stepped part 19 exists in accordance with mainly the thickness of the ceramic green sheets 16 to be absorbed. As the step difference x, in case the thickness of the ceramic green sheets is thin, since the ceramic green sheets are easily warped and the possibility of absorbing two sheets or more is raised, the step difference x is preferably larger. On the contrary, in case the thickness of the ceramic green sheets is thick, since the strength of the ceramic green sheets themselves exists and the warping is difficult, the step difference x is preferably smaller.

[0018] Also, the optimum value of the step difference x is sometimes influenced by the material of the ceramic green sheets, that is, the kind and amount of binder and plasticizer.

[0019] The laminating process shown in Figure 1 is actually carried out as shown in Figure 4. As shown in Figure 4, several trays 11A, 11B, 11C, 11D, …, and 11E are arranged, and each same kind of ceramic green sheets 16A, 16B, 16C, 16D, …, and 16E is housed in a laminated state in each of the trays 11A-11E. Then, using the absorbing head 12 shown in Figure 1, as shown by the arrowhead in Figure 4, the ceramic green sheets 16-16E are absorbed in a prescribed sequence from several trays 11A-11E and transferred up to the lamination station 13, and the ceramic green sheets 16 are laminated on the lamination station.

Brief description of the figures

Figure 1 is a cross section showing a state in which an application example of the present invention is applied.

Figure 2 is an oblique view showing the tray 11 in which several ceramic green sheets 16 shown in Figure 1 are housed.

Figure 3 is a bottom view showing the absorbing head 2 shown in Figure 1.

Figure 4 is an oblique view showing a state in which the /4 ceramic green sheets 16A-16E housed in each of several trays

11A-11E are laminated on the lamination station 13 according to the process shown in Figure 1.

Figure 5 is an oblique view showing the tray 1 used in the conventional method and the ceramic green sheets 2 arranged on it.

Figure 6 is an oblique view showing a state in which the ceramic green sheets 2A-2E are laminated using several trays 1A-1E shown in Figure 5.

Explanation of numerals:

11, 11A-11E Trays

12 Absorbing head

13 Lamination station

14 Bottom face wall

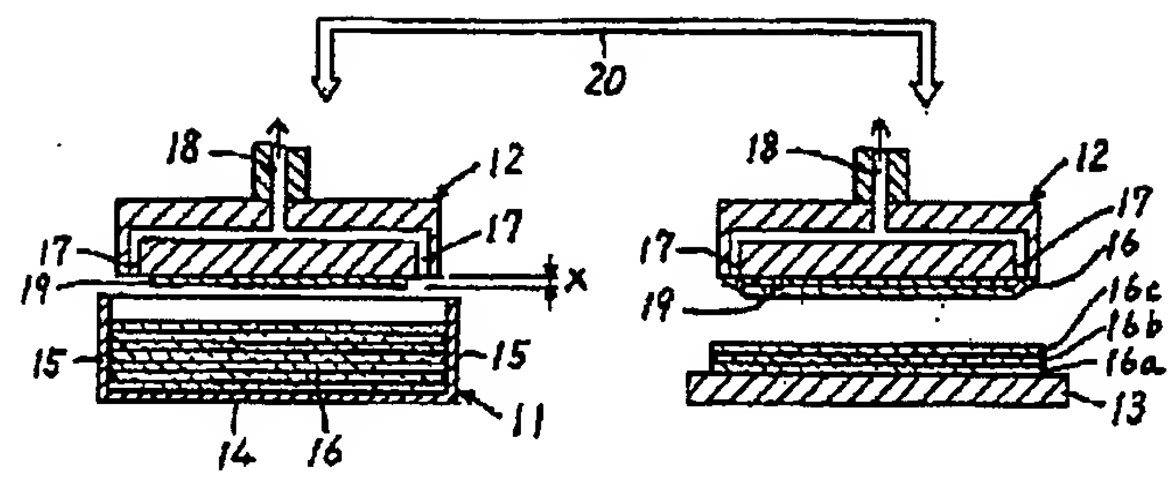
15 Side face wall

16, 16a-16c, 16A-16E are ceramic green sheets

17 Suction hole

19 Step difference part

【図1】



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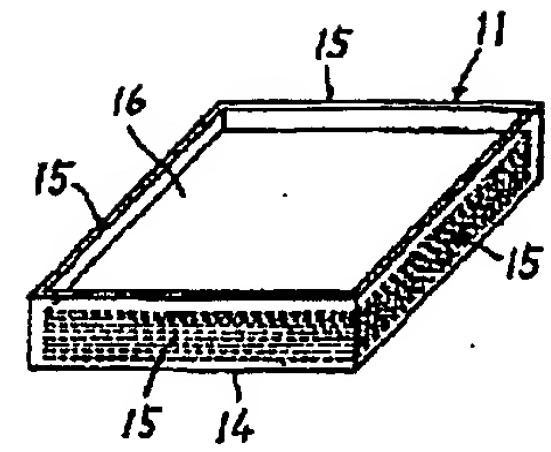

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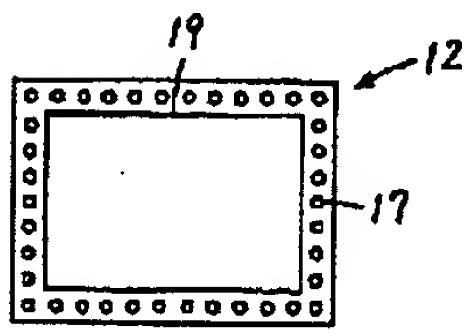

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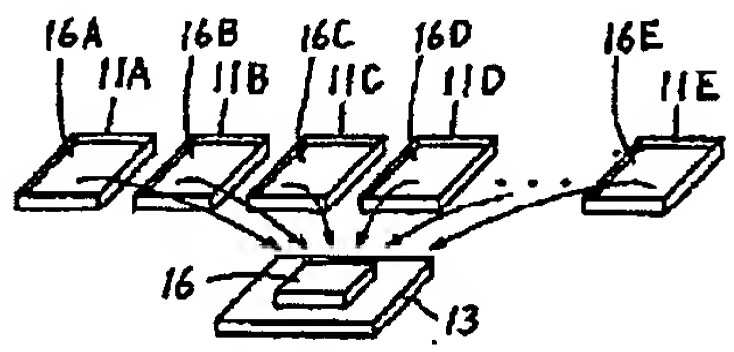
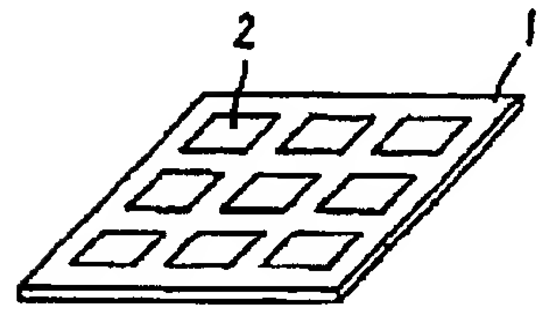


【図5】



【図6】